Trailing Cable Repair Exercise

Instructor's Copy

Behavioral Research Aspects of Safety and Health Group (BRASH)
Institute for Mining and Minerals Research (IMMR)
University of Kentucky, Lexington, Kentucky[1]

[1] This exercise was developed and field tested under U. S. Bureau of Mines research Contract No. H0348040. Information about the design and characteristics of the exercise and the field test results are available in the project technical reports filed with the Bureau of Mines Research Center in Pittsburgh, PA. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies or recommendations of the Interior Department's Bureau of Mines or the U. S. Government.

Contents

Introduction

This document contains most of the materials needed to use the exercise. The main part of the document is the instructor's copy. It tells how to use the exercise, presents the objectives, the master answer sheet, the scoring key, and discussion notes to be used following the exercise. The last part of this document is three appendices. Appendix A is the exercise problem booklet. This booklet can be duplicated locally. The booklets are reusable. One is needed for every person in the classroom. Appendix B is the answer sheet. Copies of this answer sheet must have the invisible ink answers that appear in Appendix C printed on them.[2] Answer sheets are consumable. One is needed for each small group of persons who work the exercise.

Exercise Summary

Read this section first. It determines if the exercise is appropriate for your classes. If you choose to use the exercise, examine the table of contents and review the remainder of this document.

Type:	Invisible ink
Length:	Seven questions (20 minutes administration plus 30 minutes for discussion)
Skills	Electrical safety procedures for cable splicing First aid for electrical accident victims
Location:	Underground coal mine
Problems:	You are the roof bolter operator. You report damage to the bolter's trailing cable and are waiting for it to be repaired and spliced. Fix-it, the electrician and his helper come to repair the cable. Their procedures worry you. The mine floor is wet. There is an accident. You are the only one around to help.

[2] You can do this yourself if you have the proper equipment, or you may obtain copies of preprinted answer sheets from MSHA, National Mine Health & Safety Academy, Dept. of Instructional Materials, 1301 Airport Road, Beaver, WV 25813-9426 phone 304-256-3257, fax 304-256-3368 or email to lord-mary@msha.gov.

How to Use This Exercise

1. Look at the performance objectives. Decide if the exercise is relevant for your mine training class.

2. Work through the exercise with the developing pen and score your responses.

3. Read the master answer sheet for the exercise. Look at all the answers.

4. Read the "Instructor's Discussion Notes" for the exercise.

5. Become thoroughly familiar with the problem so that you can present it to your class without reading it. Put the maps or illustrations on an overhead projector so you can use these to help explain the problem.

6. When you present the exercise to the class:

   - Give each person an exercise booklet, and each small group of 3 to 5 persons one answer sheet, and a developing pen.

   - Demonstrate how to select and mark answers using the developing pen.

   - Go over the instructions for doing the exercise with the whole group.

   - Explain the problem making sure everyone understands the problem situation.

   - Have the class members work the exercise.

   - When the class members finish, have them figure up their score using the instructions at the end of the exercise.

   - When everyone has finished, encourage class members to discuss the merits of each answer. Add your own ideas.

Performance Objectives for Trailing Cable Repair Exercise

Objective number	Capability verb(s)	Description of required performance and conditions under which it is to occur
1. EL[3]	Predict Anticipate	The occurrence and likely effects of an impending electrical accident given a description of the mechanic's actions and a sequence of local events.
2. EL	Recall Identify	Proper sequence of actions for repair of electrical equipment, including the locking out and tagging of equipment by the person doing the repairs
3. EL	Recognize Identify Evaluate	Positions and actions that place self and others at risk when working with or around electrical equipment
4. EL/FA	Recognize Identify Judge	Actions that can lessen or worsen the progression of an electrical accident and the injuries to victim(s)
5. EL/FA	Identify Anticipate Evaluate	The probable effects and consequences of actions intended to free a victim connected to a live electrical cable
6. EL/FA	Order Arrange	A sequence of actions to remove a victim connected to a live electrical cable while minimizing further injury to the victim and the rescuer(s)
7. FA	Recall Select	Procedures for conducting a primary and secondary survey
8. FA	Recognize Select Order	Proper procedures for performing artificial respiration, diagnosing and treating shock, and treating electrical burns
9. FA	Recognize Evaluate Select	Actions and statements that appropriately direct the efforts of other miners in assisting first aider(s) in caring for a victim and communicating to others a description of the accident

[3] Skill and knowledge domain abbreviations:
EL = electrical
FA = first aid

Master Answer Sheet for Trailing Cable Repair Exercise

Use this answer sheet to mark your selections. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get the information you need.

Question A

1. [Water can increase the risk of electric shock, but if all safety precautions are]
   [taken, it should not create a problem. Try again!]

2. [No temporary splice should be made in a trailing cable within 25 feet of the]
   [machine. This is within regulation. Try again!]

3. [Fix-it is an electrician. Joe can do electrical work while he is under Fix-it's]
   [supervision. Try again!]

4. [Fix-it and Joe have on rubber boots and are carrying rubber gloves. Try again!]

5. [Correct! All of the other things listed are important, but power on the cable]
   [should be checked first. Do next question.]

Question B

6. [This is a potentially dangerous situation. Your failure to act could contribute]
   [to an accident. Try again!]

7. [Correct! This is what you should do. But Fix-it tells you it's none of your]
   [business and sends Joe on. Do next question.]

8. [You should not supervise Joe while he de-energizes the cable. If Fix-it starts]
   [working before you and Joe disconnect the correct cable, he could be killed.]
   [Try again!]

9. [You are not the person who should de-energize the circuit. Try again!]

Question C (Choose only ONE unless you are told to "Try again!")

10. [Joe says it was probably Hulk, and that Fix-it will have already spliced the cable by the time Hulk puts the power up. Try again!]

11. [Fix-it is running the risk of cutting into a live cable. Try again!]

12. [Correct! Fix-it should lock out the circuit. But he says not to worry about it and lays out his tools and splice kit. Do next question.]

13. [You are not the person who should de-energize the circuit. Try again!]

Question D (Choose only ONE unless you are told to "Try again!")

14. [Good idea, but you cannot pull the cable away from Fix-it. Try again!]

15. [Good idea, but his battery comes out of the pouch and his cap and lamp pull [off. Try again!]

16. [Correct! There is no other safe way to help Fix-it. Do next question.]

17. [As soon as the bolt touches Fix-it, you are knocked to the ground by a large shock. Try again!]

Question E (Choose only ONE unless you are told to "Try again!")

18. [It is important to treat Fix-it for shock, but you should do something else first. Try again!]

19. [Going for help would take too long. Fix-it needs first aid now. Try again!]

20. [Burns should be checked and treated, but you should do something else first. Try again!]

21. [Correct! Fix-it is not breathing. Do next question.]

Question F (Choose only ONE unless you are told to "Try again!")

22. [This could hurt Fix-it. Try again!]

23. [Correct! You lift his head back, finger sweep his mouth, and begin mouth to mouth resuscitation. Do next question.]

24. [Fix-it needs your help. Try again!]

25. [Fix-it may need your help now. Try again!]

Question G

26. [You need Joe's help. Try again!]

27. [There is something more important that Joe should be doing. Try again!]

28. [Correct! Joe should go and call outside for help while you continue to treat]
[Fix-it's injuries. **End Of Problem.**]

29. [The accident should be reported to a boss, but Joe should do something else]
[that is more important. Try again!]

Finding your score

Number of "Correct" answers you colored in = (1) _____

22 minus number of incorrect answers you colored in = (2) _____

Add blanks one and two to get your total score = (3) _____

Highest possible score = 29

Lowest possible score = 0

Instructor's Discussion Notes for Trailing Cable Repair Exercise

Use the information presented here and on the master answer sheet, your own ideas and experience, and that of the miners in your class to discuss the exercise after it is completed. Group discussion can strengthen knowledge and skills, correct errors, and relate the exercise content to the experiences of the miners. After they have worked the exercise, miners enjoy discussing the problem. They also frequently think of better ways to respond to a problem than those listed among the answers. The purpose of the exercise is to help miners think about and remember basic knowledge and skills they may someday need to deal with a mine emergency. The discussion following the exercise can contribute to this goal and tailor the exercise content to the needs of the group you are training.

It is helpful to show overhead transparencies of the answers on the master answer sheet during the discussion, while the miners look at their problem booklets. This allows you to lead the group through the exercise and to discuss all the answers to each question. Most of the information about why particular answers are correct or incorrect is given on the master answer sheet.

The following notes provide additional information for you to discuss with your class. Read through and think about the notes before the class. Don't read the notes to the class members. This would be boring and ineffective. Rather, incorporate the ideas you find here with your own ideas and make these points at the appropriate place in the discussion of the exercise.

Question A - The correct answer is 5. Although the mine is wet (1), proper precautions should ensure that it is not a hazard. Since the splice is not within 25 feet of the roof bolter (2), it is in compliance with 30 CFR 75.603. Fix-it is a qualified electrician. According to 30 CFR 75.511, Joe is also qualified to do electrical repairs (3), but only under the direct supervision of Fix-it. All of the items listed could contribute to an electrical accident, but the possible failure of the electrician to de-energize, lock out, and tag the circuit before beginning electrical repairs (5), poses the greatest threat.

Question B - The correct answer is 7. Intervention at this point could prevent an accident. Reminding Fix-it that he, not Joe, should disconnect, lock out, and tag the cathead for the roof bolter trailing cable, is at least an attempt to comply with 30 CFR 75.511 and avoid the hazards of Fix-it inadvertently cutting into an energized cable. Both 8 and 9 leave the task of de-energizing the circuit to someone other than the person making the repairs. Discuss the responsibility that the person de-energizing a circuit for someone else is assuming.

Question C - The correct answer is 12. Sending a third party to check to see whether the cable has been properly disconnected (13), failing to add a second tag to the cathead (10), or splicing the cable without any further attempt to establish whether the cable is de-energized (11), can all have deadly consequences. At this point Fix-it shows little concern for the possible hazard but your suggestion that he add his lock to the cathead (12), could prevent an accident.

Question D - The correct answer is 16.

Question E - The correct answer is 21. A primary survey should be conducted to check Fix-it for injuries. Although burns (20), and shock (18), are legitimate concerns, the first priority is to check for breathing. Electrical shock victims often suffer from respiratory arrest and require artificial respiration and possibly CPR to re-establish breathing and heartbeat. Going for help (19), must wait until Fix-it has been checked and treated for life-threatening injuries.

Question F - The correct answer is 23. Victims of electrical shock often stop breathing. Mouth to mouth recusitation can often prevent death. CPR (22), should only be administered by a qualified person, and then only after checking breathing and circulation. Even if Fix-it had no pulse (24), it would be important to do something, such as administer mouth to mouth breaths or go for help. Running for help (25), without first trying to restore Fix-it's breathing could result in his death.

Question G - The correct answer is 28. Once Fix-it's breathing has been re-established and he is being treated for shock and burns, outside help should be sought. The cable is not a threat if it is locked and tagged properly. Joe should not spend time finding someone to make repairs (27). Reporting the accident to a boss (29), unnecessarily delays seeking help from the surface. Blaming Joe for the accident (26), is inappropriate and also wastes time in notifying outside personnel. In addition, Joe's reaction to the incident should not be ignored. Witnesses often suffer from psychological shock. In this case, Joe is likely to blame himself for the injury to Fix- it, further increasing his chances of being distracted and doing something foolish. If you suspect Joe is very upset, how would this change the situation? Discuss this with your class.

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Scoring Key for Trailing Cable Repair Exercise

The correct answers are marked with an asterisk.[4]

Question	Answer Number				
A	1	2	3	4	5*
B	6	7*	8	9	
C	10	11	12*	13	
C	14	15	16*	17	
E	18	19	20	21*	
F	22	23*	24	25	
G	26	27	28*	29	

[4] This page is printed in large type so that it may be copied and used as an overhead transparency.

Appendix A: Problem Booklet

Duplicate this copy of the problem booklet for use in your classes. **Booklets should be printed on only one side of the paper.** Each person in your class should have a problem booklet while they are working the exercise. The problem booklets are reusable.

You may obtain a copy of the problem booklet from MSHA, National Mine Health & Safety Academy, Dept. of Instructional Materials, 1301 Airport Road, Beaver, WV 25813-9426 phone 304-256-3257, fax 304-256-3368 or email to lord-mary@msha.gov.

Trailing Cable Repair Exercise

Problem Booklet

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and Health Group (BRASH)
Institute for Mining and Minerals Research (IMMR)
University of Kentucky, Lexington, Kentucky

Instructions

Read the problem situation described on the next page. Study the map on page 4 until you understand the location of the miners and equipment in the problem. Next, answer each of the 7 questions. Do them one at a time. Don't jump ahead, but you may look back to earlier questions and answers. There is one correct choice for each question.

After you have selected a choice to a question, look up the number for that choice on the answer sheet. Select your answer to each question by rubbing the developing pen between the brackets on the answer sheet. A hidden message will appear and tell you if this is the correct choice or if you need to "Try again!". The object is to select the correct choice for each question in as few attempts as possible. When you have finished, you will learn how to score your performance.

Background

Fix-it is a qualified mine electrician.

Joe is new to this mine.

You are trained in basic first aid, but not CPR.

Problem

You are the roof bolter operator in the #1 entry, as shown in Figure 1 on page 3. You have reported damage to the bolter's trailing cable and are waiting for the cable to be spliced. The damage is about 30 feet from the bolting machine. The mechanic, Fix-it, and his helper, Joe, come to make the splice. Your helper has left the pinner and no one else is around. The section is wet.

Now turn to the first question and begin.

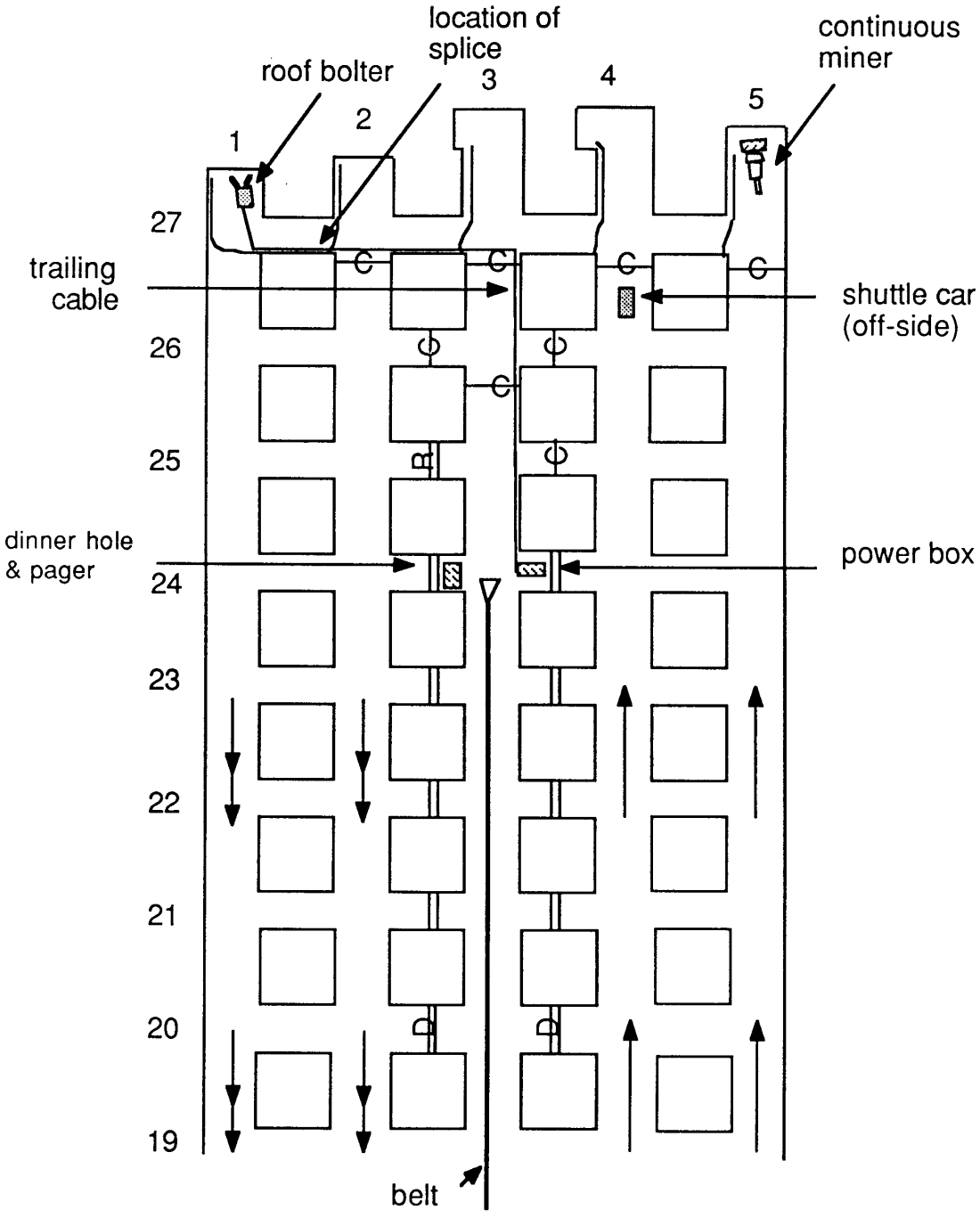

Figure 1: Section Map

Question A

What is the first thing that should be checked before making the splice in the cable?

1 Water in the mine

2. Location of the splice

3. The qualifications of Fix-it and Joe

4. Personal protective equipment

5. Power on the cable

Question B

Fix-it sends Joe to cut the power. What should you do?

6. Nothing, it is not your job.
7. Tell Fix-it that he should trace the cable back, lock it out, and tag it himself.
8. Go with Joe to be sure that he disconnects the correct cable.
9. Offer to do it yourself. It's your machine and you're just standing around anyway.

Question C

Joe returns and tells Fix-it that the cable had already been disconnected when he got to the power box. What should Fix-it do now?

10. Send Joe to find out who disconnected the cathead.

11. Go ahead and splice the cable.

12. Go to the power box and add his lock to the cathead.

13. Send you to the box to see if the cable is disconnected properly.

Question D

Joe goes onto the dinner hole to grab a sandwich. Fix-it cuts into the cable. He jerks and then slumps to the floor, with his arms and upper body across the cable. What is the first thing you should do?

14. Put on dry gloves, stand in a dry spot, and pull the cable out from under Fix-it.

15. Stand in a dry spot and use dry gloves to grab Fix-it's cap lamp cord and pull him away from the cable.

16. Go and cut the power at the box.

17. Grab a dry roof bolt and use it to roll Fix-it off the cable.

Question E

The power has been cut and you have moved Fix-it away from the cable. What is the first thing you should do now?

18. Cover Fix-it with a coat to keep him warm.

19. Go get help.

20. Check Fix-it's hands for burns.

21. Check Fix-it's breathing.

Question F

When you find Fix-it is not breathing, what should you do?

22. Immediately begin CPR.
23. Check his airway and begin mouth to mouth rescue breathing if necessary.
24. Take his pulse. If his pulse is absent, do nothing.
25. Run and get help.

Question G

After about 5 minutes of mouth to mouth rescue breathing, Fix-it begins breathing on his own. While you are treating Fix-it for shock and burns, Joe comes back. What is the first thing you should tell him to do?

26. Stay out of the way, he's caused enough trouble.

27. Go and find someone to finish splicing the damaged cable.

28. Go and phone outside to report the accident.

29. Go and find a boss and report the accident.

End of Problem

Scoring your performance

1 . Count the total number of responses you colored in that were marked "correct." Write this number in the first blank on the answer sheet.

2. Count the total number of "incorrect" responses you colored in. Subtract this number from 22. Write the difference in the second blank on the answer sheet.

3. The best score is 29. The worst score is 0.

Appendix B: Answer Sheet Blanks

These are the answer sheet blanks. Copies of these blank answer sheets may be duplicated in the normal fashion. However, the answers that are found within the brackets must be printed on these blank answer sheets in invisible ink. These answers are found in Appendix C. If you have the capability to print invisible ink, make copies of the blank answer sheets. Make a master of the answers that appear in Appendix C. Then print the invisible ink on the blank answer sheets, being careful to make sure all pages print and that the appropriate answers line up with the appropriate blanks. The Master Answer Sheet shows all the answers in their proper places.

Most companies and trainers prefer to obtain copies of the preprinted answer sheets from MSHA, National Mine Health & Safety Academy, Dept. of Instructional Materials, 1301 Airport Road, Beaver, WV 25813-9426 phone 304-256-3257, fax 304-256-3368 or email to lord-mary@msha.gov.

The exercise is designed to be used in small groups. You will need one answer sheet for each group of 3 to 5 persons in your class. The answer sheets are consumable. You will need a new set for each class.

A developing pen is also needed by each person who marks an answer sheet.

Answer Sheet for Trailing Cable Repair Exercise

Use this answer sheet to mark your selections. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get the information you need.

Question A

1. [ ]
   [ ]

2. [ ]
   [ ]

3. [ ]
   [ ]

4. [ ]

5. [ ]
   [ ]

Question B

6. [ ]
   [ ]

7. [ ]
   [ ]

8. [ ]
   [ ]
   [ ]

9. [ ]

Question C

10. [ ]
    [ ]

11. [ ]

12. [ ]
    [ ]

13. [ ]

Question D

14. [ ]

15. [ ]
    [ ]

16. [ ]

17. [ ]
    [ ]

Question E

18. [ ]
    [ ]

19. [ ]

20. [ ]
    [ ]

21. [ ]

Question F

22. [ ]

23. [ ]
    [ ]

24. [ ]

25. [ ]

Question G

26. [ ]

27. [ ]

28. [ ]
    [ ]

29. [ ]
    [ ]

Finding your score

Number of "Correct" answers you colored in	=	(1) _____
22 minus number of incorrect answers you colored in	=	(2) _____
Add blanks one and two to get your total score	=	(3) _____

Highest possible score = 29

Lowest possible score = 0

Appendix C: Invisible ink Answers

These pages contain the answers that must be printed in the blanks of the answer sheet in Appendix B. These answers are spaced and sequenced correctly so that they exactly match up with the appropriate blanks on the answer sheet blank.

Once the answers have been printed in the answer sheet blanks, the developing pen reveals the formerly invisible printed message.

You may obtain preprinted answer sheets or you may prepare your own copies. To learn more about these options, and to determine how many answer sheets and developing pens you will need, see the introductory section of the Instructor's Copy.

Water can increase the risk of electric shock, but if all safety precautions are taken, it should not create a problem. Try again!

No temporary splice should be made in a trailing cable within 25 feet of the machine. This is within regulation. Try again!

Fix-it is an electrician. Joe can do electrical work while he is under Fix-it's supervision. Try again!

Fix-it and Joe have on rubber boots and are carrying rubber gloves. Try again!

Correct! All of the other things listed are important, but power on the cable should be checked first. Do next question.

This is a potentially dangerous situation. Your failure to act could contribute to an accident. Try again!

Correct! This is what you should do. But Fix-it tells you it's none of your business and sends Joe on. Do next question.

You should not supervise Joe while he de-energizes the cable. If Fix-it starts working before you and Joe disconnect the correct cable, he could be killed. Try again!

You are not the person who should de-energize the circuit. Try again!

Joe says it was probably Hulk, and that Fix-it will have already spliced the cable by the time Hulk puts the power up. Try again!

Fix-it is running the risk of cutting into a live cable. Try again!

Correct! Fix-it should lock out the circuit. But he says not to worry about it and lays out his tools and splice kit. Do next question.

You are not the person who should de-energize the circuit. Try again!

Good idea, but you cannot pull the cable away from Fix-it. Try again!

Good idea, but his battery comes out of the pouch and his cap and lamp pull off. Try again!

Correct! There is no other safe way to help Fix-it. Do next question.

As soon as the bolt touches Fix-it, you are knocked to the ground by a large shock. Try again!

It is important to treat Fix-it for shock, but you should do something else first. Try again!

Going for help would take too long. Fix-it needs first aid now. Try again!

Burns should be checked and treated, but you should do something else first. Try again!

Correct! Fix-it is not breathing. Do next question.

This could hurt Fix-it. Try again!

Correct! You lift his head back, finger sweep his mouth, and begin mouth to mouth recusitation. Do next question.

Fix-it needs your help. Try again!

Fix-it may need your help now. Try again!

You need Joe's help. Try again!

There is something more important that Joe should be doing. Try again!

Correct! Joe should go and call outside for help while you continue to treat Fix-it's injuries. **End Of Problem.**

The accident should be reported to a boss, but Joe should do something else that is more important. Try again!